Terminology

System - All files developed for the purposes of satisfying the client level requirements.

- **Data display module** - displays status updates and events to the user
- **Controller simulator** - Generates status updates and events then sends via RS422 serial protocol to the data display module.
- **Event Log file** - Will be generated by the data display module to contain 1 or more event strings encountered during a session.
- **Installer** - will deploy the project in the customers system and perform environment setup and initialization. Will record initial user preferences and take them into account during installation. I.e. “Do you want a shortcut on your desktop?”

Environment - The directory our system will be placed in and all of its contents.

Serialized data - A string of 1s and 0s which can be translated to traditional data such as strings and integers. Only serialized data can be sent through serial ports

Serial Port - The physical hardware port which can send and receive serialized data.

Status data - (See class diagram for specifics) General data pertaining to the weapon which can be measured at any point in time during session.

Event String - A string of the format “<time> <event message> <param 1> <param 2> <param 3>” generated by the controller simulator to simulate the occurrence of a weapon related event. The parameters can be NULL, but the event message must be specific text outlining what the event is. Ex. “[00:12:41] Weapon overheat 237 200” where 237 represents measured barrel temp and 200 represents max recommended barrel temp in degrees celsius.

Session - The time measured from the moment the controller sim is connected to the data display module to the moment the controller sim is disconnected from the data display module.

Handshake Protocols - A necessary set of agreements between two devices before they perform serial communication.

Electrical data - A data structure containing float values for current and voltage and a name for the component.

Command Line Interface - method of interacting with programs on a computer by inputting text commands /data/ prompts.

Automatic Log File Generation - The ability for the system to automatically generate an event log file after a session has ended.

Traceability Matrix

The purpose of this table is to define which system requirements satisfy each client requirement and which software requirements/functions will be used by each system requirement.

Client requirement	System requirements	Software requirements
CR01 The data display module shall be a desktop application.	**R01** The data display module shall be an .exe file.	NA
	R02 The data display module shall display a GUI.	SR15 - SR19
CR02 The data display module shall read input data via RS422 serial protocol from the controller simulator.	**R03** The data display module shall be capable of serializing / deserializing messages received via an RS422 serial port.	SR01 - SR05 SR08
	R04 The controller simulator shall be capable of serializing / deserializing messages received via an RS422 serial port.	SR01 - SR05 SR08
CR03	**R05**	SR11 SR15

The data display module shall have the ability to write event data into a log file	The data display module shall be capable of generating a log file including all known events when requested by the user	
	R06 The user shall be able to determine if a log file will be automatically generated after a session.	SR11 SR20
	R07 The user shall be able to determine how many auto saved log files will be kept before overwrites occur on the oldest autosaved file.	SR20
CR04 The data display module shall display all weapon status information directly to the application's window for the duration of a session.	**R08** The controller simulator shall send status updates through the designated serial port every 250 milliseconds.	SR01 SR05 SR14
CR05 The controller simulator shall send event updates to the data display module.	**R09** The controller simulator shall send event updates through the serial port at most 100 milliseconds after they are generated. second after they are generated.	SR01 SR05 SR12 SR13
CR06 The data display module shall not require admin rights to install, set up, or use.	**R10** The data display module shall not require admin rights to install setup or use	NA
CR07	**R11** The data display module shall have the capability to display	SR13

The data display module shall include filtering options to filter events and errors	**only errors** to the Events tab of the GUI	
	R12 The data display module shall have the capability to display **only cleared errors** to the events tab of the GUI.	SR21
	R13 The data display module shall have the capability to display **only active errors** to the events tab of the GUI.	SR21
	R14 The data display module shall have the capability to display only **non-error events** to the events tab of the GUI.	SR21
CR08 The system and its environment shall be installed via an installer file.	**R15** The system and its environment shall be installed via an installer file	NA
CR09 The system shall be portable on Windows 10 or 11	**R16** The system shall be portable on Windows 10 or 11	NA
CR10G The system should be portable on Debian linux distributions	**R17G** The system should be portable on Debian linux distributions	NA

Client level requirements

- **CR01** - The data display module shall be a desktop application.
- **CR02** - The data display module shall read input data via RS422 serial protocol from the controller simulator through a user specified port.
- **CR03** - The data display module shall have the ability to write event data into a log file
- **CR04** - The data display module shall display all status information directly to the application's window for the duration of a session.
- **CR05** - The controller simulator shall send event updates to the data display module.
- **CR06** - The data display module shall not require admin rights to install, set up, or use.
- **CR07** - The data display module shall include filtering options to filter events and errors
- **CR08** - The system and its environment shall be installed via an installer file.
- **CR09** - The system shall be portable on Windows 10 or 11
- **CR10G** - The system should be portable on Debian linux distributions

System Level Requirements

- **R01** - The data display module shall be an .exe file.
- **R02** - The data display module shall display a GUI.
- **R03** - The data display module shall be capable of serializing / deserializing messages received via an RS422 serial port.
- **R04** - The controller simulator shall be capable of serializing / deserializing messages received via an RS422 serial port.
- **R05 -** The data display module shall be capable of generating a log file including all known events when requested by the user
- **R06** - The user shall be able to determine if a log file will be automatically generated after a session.
- **R07** - The user shall be able to determine how many auto saved log files will be kept before overwrites occur on the oldest autosaved file.
- **R08** - The controller simulator shall send status updates through the designated serial port every 250 milliseconds.

- **R09** - The controller simulator shall send event updates through the serial port at most 100 milliseconds after they are generated.
- **R10** - The data display module shall not require admin rights to install setup or use
- **R11 -** The data display module shall have the capability to display **only errors** to the Events tab of the GUI
- **R12** - The data display module shall have the capability to display **only cleared errors** to the events tab of the GUI.
- **R13** - The data display module shall have the capability to display **only active errors** to the events tab of the GUI.
- **R14** - The data display module shall have the capability to display only **non-error events** to the events tab of the GUI.
- **R15 -** The system and its environment shall be installed via an installer file
- **R16** - The system shall be portable on Windows 10 or 11
- **R17G** - The system should be portable on Debian linux distributions

Software Level Requirements

Serial Communication:

- **SR01 -** The software shall be capable of generating *serialized* versions of given *status data* and *event data.*
- **SR02 -** The software shall be capable of generating *status data* given *serialized* status data.
- **SR03** - The software shall be capable of generating an *event string* given a *serialized event string*.

- **SR04** - The software shall be capable of generating *electrical data* given *serialized electrical data.*
- **SR05** - The software shall be capable of sending *serialized data* through a *serial port*.
- **SR06** - The software shall be configurable to fill one of the the following roles during *handshake protocols*
    a. send the first contact message every 5 seconds until a response is received
    b. listen for the first contact message, then respond.
- **SR07** - *Handshake protocols* shall be implemented using the Boost.Asio serial library
- **SR08** - The software shall be able to listen for and record serialized bit strings from a given *serial port*.
- **SR09** - The software shall be able to pause serial communication
- **SR10** - The software shall be able to resume serial communication
- **SR11** - The software shall be capable of storing all event strings received via serial communication until a new session is started or the program ends.

Controller Simulator:

- **SR12 -** The software shall be capable of generating *event strings* with random *parameters* given a collection of *event messages*.
    - **Note:** See terminology section for definitions of event string, event message and parameters
- **SR13 -** The software shall be capable of reading *event strings* from the *command line interface*.
- **SR14 -** The software shall be capable of generating randomized *status data*.

Data Display Module:

- **SR15 -** The software shall be capable of writing an event log file in csv format, given a collection of events upon user request.
- **SR16 -** The software shall be capable of opening the events page when the events button is pushed.
- **SR17 -** The software shall be capable of opening the status page when the status button is pushed.

- **SR18 -** The software shall be capable of opening the electrical page when the electrical button is pushed.
- **SR19 -** The software shall be capable of opening the connection settings page when the connection settings button is pushed.
- **SR20** - The software shall allow the user to input how many auto saved log files they want to be kept before overwrites occur on the oldest autosaved file.
- **SR21** - The software shall allow the user to input what filter they want on the event page out of the following options.
    a. Only errors
    b. Only cleared errors
    c. Only active errors
    d. Non error events